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## *Donrichardsia*, a New Genus of Amblystegiaceae (Musci)

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Outliers from the ancient flora of the Ozark Mountains are to be found westward in the highlands of west-central Texas, in an area of limestone habitats known as the Edwards Plateau. Bryologists have not made a thorough search of that dry and forbidding area for whatever rarities might occur there. Eula Whitehouse (1954) recorded only a few mosses from the plateau. Paul Redfearn (1973, 1976) has collected there in recent years, but has thus far reported only two records of interest (a new species of *Isopterygium* and a variety of *Trichostomum crispulum* new to the flora of the United States). His record of *Erpodium acrifolium* from the vicinity of Austin, not far to the east, indicates a possibility of Mexican intrusion into the flora, perhaps from the San Carlos Mountains of northeastern Mexico where the bryophyte flora, though limited, is decidedly like that of the Ozarks and presumably like that of the Edwards Plateau.

Whitehouse, in 1932, found a most curious moss in limey spring waters at Seven Hundred Springs in Edwards County, Texas. Grout (1933) described it as a new species of *Hygroamblystegium*. Because of its remarkably stout costa, he named it *H. macroneuron*. Grout admitted that the generic affinities would remain uncertain

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until sporophytes were found. It was because of the habit of growth, on rocks in the water, and the general appearance of the plants that he saw a resemblance to that genus and more specifically to *H. noterophilum*. Both species are decidedly calciphilic. They are coarse, robust plants, often encrusted with lime, and their older portions often appear bristly because of erosion of all but the stout midribs of the leaves.

The leaf cells are unlike those of *Hygroamblystegium*, and nothing about the structure of the plants gives clear indication of a relationship to that genus, other than the fact that the pseudoparaphyllia are broadly orbicular. Pseudoparaphyllia are common in the Amblystegiaceae but not in the Brachytheciaceae (Ireland, 1971), including the genus *Eurhynchium*, which has some aquatic members superficially similar to the Texan plant. It may be that the only genus of Brachytheciaceae with pseudoparaphyllia is *Conardia*, which has a considerable resemblance, in appearance and habitat, possibly in structure, to the Amblystegiaceae (Robinson, 1965, 1976). Crum (1969) recognized the fact that *Hygroamblystegium macroneuron* has little in common with other members of that genus and purely as an interim solution attached it to the genus *Eurhynchium*, owing to some similarities in habitat, appearance, leaf shape, serrulation, and areolation to the *Platyhypnidium* segregates from *Eurhynchium*, such as *E. riparioides*. The availability of additional material clearly showing the nature of the species as well as its considerable variation makes it possible to assign the species to the Amblystegiaceae and to a new genus, *Donrichardsia*, on the basis of positive rather than suggestive evidence.

The genus is characterized by growth on rocks submerged by lime-impregnated waters. The plants, coarse and robust, with the appearance of a *Hygroamblystegium* or a *Hygrohypnum*, are made unique by broad leaves with broad points (bluntly acute to rounded-obtuse and commonly abruptly cuspidate); margins serrulate in the upper half and often coarsely dentate near the base of the cuspidate apex; costa very stout and single, though sometimes laterally spurred by thickened streaks of cells similar to those found elsewhere in the lamina (and sometimes at or near the margins); upper median cells linear-flexuose and minutely papillose at back owing to the thickening of upper ends; and apical cells rather noticeably shorter than the upper median cells.

The remarkable nature of this plant was well illustrated by Grout (1933), although he did not show the considerable variability of the leaves in shape and structure. Figures 1 and 2, prepared for our forthcoming *Mosses of Eastern North America*, give some characteristics not exhibited in the original collection, such as the excurrency of the costa into a stoutly cuspidate point and the irregular notching or coarse serration at the leaf tip. The papillosity of the upper leaf cells, not previously given notice in the literature, is shown in Figure 2. The magnification of Figure 2H is much like that given by high power of the light microscope.

The Amblystegiaceae, in their evolution, have deployed into the wet niches of the environment. The aspect of *Hygroamblystegium macroneuron*, or *Donrichardsia*, as we propose to call it, is compatible with that found in such amblystegiaceous genera as *Hygrohypnum* and *Hygroamblystegium*. The leaf shape and areolation show resemblances to many members of the family, including *Hygrohypnum*, some species of which also show a costa varying from one leaf to another. In *Donrichardsia* the costa is often branched laterally, sometimes as mere spurs, sometimes conspicuously so. In *Hygrohypnum* the costa may be single or forked from near the base and thus essentially double, but in *Calliargon* the single costa may be laterally spurred. The papillae are similar to those of some species of *Cratoneuron*. The thickened longitudinal streaks of cells, whether extending from the costa as spurs, isolated in the lamina, or near the margins forming more or less distinct borders, hint at a relationship to *Sciaromium*, with its distinctive border of differentiated cells, or to *Limbella*, with a tricostate appearance. The latter genera seem, however, to be much more closely allied to *Hygroamblystegium*, as they have short leaf cells quite unlike those of *Donrichardsia* or other genera more clearly related to *Hygrohypnum*.

There is no good reason to look for a relationship in the Brachytheciaceae. That family has, for the most part, occupied drier habitat niches than the Amblystegiaceae. Except for some superficial resemblance to the aquatic species of *Eurhynchium*, as noted above, and a development of papillae similar to those of *Bryhnia*, there are no similarities worthy of consideration, at least in the absence of sporophytes. And even between the Amblystegiaceae and the Brachytheciaceae, the shape of the capsule and the color of the peristome are not always as diagnostic as one might wish. The



Fig. 1. *Donrichardia macroneuron*. A, Habit,  $\times 2$ . B, Cells at leaf tip,  $\times 238$ . C, Cells at leaf base,  $\times 249$ . D, Leaf outlines,  $\times 33$ . E, Cross-section of a portion of the leaf showing the costa and a pluristratose longitudinal streak in the lamina,  $\times 106$ . F, Cells at leaf tip, showing shortness of apical cells in comparison with the upper median cells,  $\times 238$ . G, Upper median cells of leaf,  $\times 238$ .



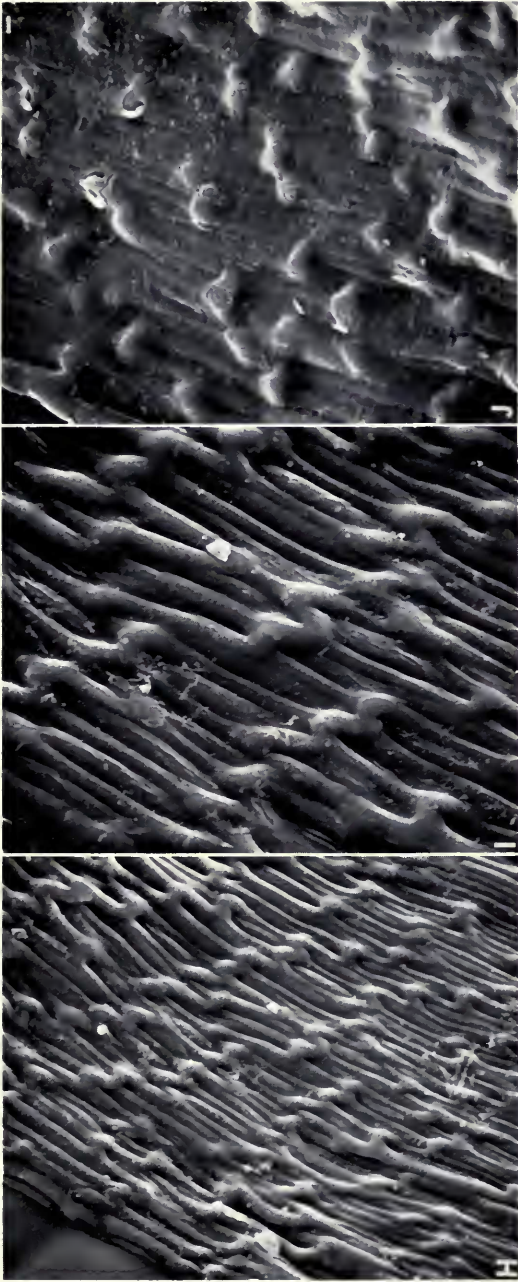


Fig. 2. *Donrichardia macroneuron*. Scanning electron micrographs of upper leaf cells, showing papillae formed by thickened upper ends; H,  $\times 490$ ; I - J,  $\times 980$ .

presence of pseudoparaphyllia in *Donrichardsia* supports our argument for including it in the Amblystegiaceae, although we freely grant that the evolutionary significance of pseudoparaphyllia is yet untried.

Whitehouse & McAllister, in their 1954 account of the mosses of Texas, cited three collections from wet rocks below springs at Seven Hundred Springs, by Eula Whitehouse (January 1 and November 12, 1932) and Mrs. W.R. Eckert (April 1, 1933). They stated that a dam constructed in more recent years had flooded the rocks at the base of the springs. Ann Stoneburner and Robert Wyatt recently obtained permission to visit the type locality at Seven Hundred Springs, which is located on a large, privately owned ranch. They found the species in abundance over boulders and on the sides of rocks in the springs and apparently flourishing. They found no evidence of damming or flooding at the site. They made further searches, without success, at a large number of seemingly similar calcareous springs there and elsewhere along the South Llano River.

Grout distributed as his *North American Musci Pleurocarpi*, Supplement no. 43 "co-type" material of *Hygroamblystegium macroneuron*. It was material collected by Whitehouse in November 1931, 10 months after the collection of the holotype. It is thus no more than a topotype, just as is the later collection by Stoneburner & Wyatt.

We are glad to name so distinctive a genus for Donald Richards as a mark of friendship. Now retired from business, Mr. Richards has long been associated with Field Museum of Natural History. Though not active in research, he has had an enduring interest in bryology and an important influence on bryologists. He is, as far as we know, the only Life Member of the American Bryological and Lichenological Society.

### DONRICHARDSIA new genus

Plantae permagnae, aliquando rigidiusculae, fusco-virides. Caules suberecti, dense et fastigiatae ramosi. Folia oblongo-lanceolata vel oblongo-ovato, late acuta vel obtusa, saepe breviter cuspidata et aliquando abrupte ad apicem dentata; costa latissima (plus minus 200  $\mu\text{m}$  latitudine), saepe irregulariter ramosa, in parte subapicale terminans vel in mucrone breviter excurrentis; cellulae saepe in linearis longitudinalis pluristratosae, in medio folii anguste oblongae vel lineari-flexuosae. Caetera ignota.

Plants large and coarse, ca. 14 cm. long, fairly rigid, dull, dark-green to brownish, in dense to loosely interwoven masses. Stems irregularly to fastigiately branched; cortical cells small and thick-walled, surrounding 3-6 layers of larger, thick-walled cells and an inner area of large, thin-walled cells; central strand small and in-

conspicuous. Pseudoparaphyllia foliose, broad and suborbicular, broadly rounded at the apex, entire to irregularly serrulate at the apex. Leaves loosely erect and  $\pm$  subsecund when dry, erect-spreading when moist, 1.5-1.8 mm. long, oblong-lanceolate to oblong-ovate, bluntly acute to obtuse or rounded-obtuse and sometimes abruptly cuspidate; margins plane, serrulate in the upper half, often in cuspidate leaves abruptly notched or coarsely dentate on 1 or both sides of the cusp; costa about one-third the width of the leaf base and about 160-200  $\mu\text{m}$  wide below, only slightly tapered upward, ending somewhat below the apex to excurrent into a stout cuspidate point, elliptical in section at the leaf middle and composed of uniformly small cells except for a scattering of larger cells at the center; cells at the apex  $\pm$  rhombic, the upper median cells longer and linear-flexuose, minutely papillose at back because of thickened upper ends, pluristratose in fairly conspicuous longitudinal streaks (sometimes as much as five layers thick), sometimes as spurs from the costa and often at or near the margins; basal cells oblong-linear, thick-walled, not differentiated in the alar regions. Inflorescences and sporophytes unknown.

**Donrichardsia macroneuron** (Grout) new combination. Figures 1, 2.

*Hygroamblystegium macroneuron* Grout, Bryologist 36: 1. Figs. 1-5. 1933.

*Eurhynchium macroneuron* (Grout) Crum, Bryologist 72. 242. 1969.

*Specimens examined*.—Edwards Co., Texas: In springs along the banks of Llano River, near Junction, *Eula Whitehouse*, January 1, 1932 (holotype, DUKE; isotype, MICH), November 12, 1932 (distributed as Grout's No. Amer. Musci Pleur. Suppl. no. 43, DUKE, MICH, CANM, etc.); over boulders and sides of rocks in springs, limestone cliff on the South Llano River, Seven Hundred Springs, 20 miles SW of Junction, *Ann Stoneburner & R. Wyatt* 1485, March 4 1978 (DUKE).

#### SUMMARY

*Donrichardsia* is described as a new genus of the Amblystegiaceae. It is known by its aquatic habitat and oblong-lanceolate to oblong-ovate, broadly pointed to rounded-obtuse and often abruptly cuspidate leaves. Leaf margins are serrulate above the middle and often coarsely dentate at the base of the cusp. The costa is very stout (about one-third the width of the leaf base), single but often laterally spurred; the ending varies from being near the leaf apex to being shortly excurrent. Leaf cells are linear-flexuose, minutely papillose at the back because of thickened upper ends, and pluristratose in longitudinal streaks. The genus is based on *D. macroneuron* (Grout) n. comb., known from calcareous springs at a single locality in Edwards County in central Texas. Originally

described as *Hygroamblystegium*, the species was later transferred, by Crum, to *Eurhynchium* because of superficial resemblances to the aquatic species sometimes segregated as *Platyhypnidium*.

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